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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/862,593	05/23/2001	Dan A. Steinberg	ACT.010	8379

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HALEOS, INC.  
3150 STATE STREET  
BLACKSBURG, VA 24060

EXAMINER

SAGAR, KRIPA

ART UNIT PAPER NUMBER

1756

DATE MAILED: 02/24/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/862,593

Applicant(s)

STEINBERG, DAN A.

Examiner

Kripa Sagar

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 May 2001.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \*   c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "105a" and "105b" have both been used to designate core structure of the wave guide in fig. 1(l) and 1 (m). The core structure in fig. 1(m) should be labeled "105a".

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

Reference to distance "D' in Fig 1(m).

Reference number '214' is missing in fig.2(h),2(i),3(j),3(k),3(l),3(m). Other reference numbers to layers are missing in Figs. 7(d), 7(e). Missing annotation to arrows in fig. 3(b).

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Art Unit: 1756

3. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat. 5784509 to Yamane et al.

The invention discloses an optical waveguide and a micromachined feature fabricated on a substrate using a single masking process.

The instant claims recite the steps of forming the integrated waveguide and a micromachined feature using the same metal mask in two etching steps. The micromachined feature is a groove with an inclined surface.

Yamane teaches the steps in fabricating a structure to connect an optical fiber and an integrated waveguide. The groove for the optical fiber is the micromachined structure with inclined surfaces and the waveguide is formed by patterning a stacked layer of cladding materials sandwiching a patterned core layer (fig.34-42). In these figures the *core pattern* 32 is formed over the under-clad 31. A *planar metal* etch-mask (63) is patterned over the stack and the core (63A) and second portions (63B) are formed. The resist is removed over the core and an *upper clad layer* is formed over the entire structure. The upper-clad is covered with a *second etch mask* (36, Fig.39) and etched to the end of the core. Grooves are etched into the substrates with *sloping walls* (24,61A,B; Fig.41). It is noted that the same etch-mask 63 is used for both the core structure and the groove. Thus all the elements of claims 1-5 are anticipated by Yamane (see second embodiment: 23;8-29;15).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 6-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamane in view of US Pat. 5384872 to Jacobs-Cook et al. ('872) and further in view of US Pat. 5961683 to Mizuta et al.

These claims recite the steps of forming a recess in a substrate and fabricating an embedded waveguide and a micromachined feature using a single masking step for the two features.

The teachings of Yamane have been discussed above with respect to the fabrication of a micromachined structure and an integrated waveguide.

Yamane does not teach forming an embedded waveguide in the substrate. It does not teach forming an etch-mask over the upper cladding layer that extends over the first etch-mask (clm. 6,12,19,25). It does not teach depositing a Si<sub>3</sub>N<sub>4</sub> layer over the substrate below the core layer (clm. 9,15,22,28; fig. 6).

Embedded waveguides are known in the art as shown by the '872 reference (fig.8) wherein a recess 4 is formed in the substrate and the waveguide 26, 28 is fabricated in the recess.

Art Unit: 1756

The '872 reference does not teach a Si<sub>3</sub>N<sub>4</sub> layer or an etch-mask over the upper cladding layer.

For enhancing the etch-selection over the substrate it is known to use Si<sub>3</sub>N<sub>4</sub> layer as a substitute for SiO<sub>2</sub>. Mizuta teaches the use of Si<sub>3</sub>N<sub>4</sub> layer instead of SiO<sub>2</sub> (4;18-24). It may be noted that Mizuta uses the layer for etching the groove 9 in the Si-substrate.

The references do not teach diverse masking layers or the overlap of the masking layers over the micro-machined structure area. This is essentially a design feature determined by the structure and the process flow for the fabrication of the device. Yamane's mask layer 36 (fig.39) stops at the edge of the core pattern so that a groove 27(fig.41-42) can be cut at the intersecting plane of the micromachined structure and the waveguide. Yamane's goal is accurate alignment of a fiber with the waveguide. In Mizuta's design, with the *same goal of alignment*, the etch-mask 5 (fig.2C) extends over the micromachined structure area. The waveguide structure is etched back to form the aligning groove 9 (fig.2E) in the substrate.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form embedded wave guides as taught by the '872 reference using Si<sub>3</sub>N<sub>4</sub> etch-resist layer as taught by Mizuta in fabricating Yamane's optical device with a micromachined structure. The motivation for combining them arises from the teachings of the '872 reference that embedded waveguides provide a good seal in the recess and is damped against vibrations (5;56-64) while Mizuta teaches that Si<sub>3</sub>N<sub>4</sub> may replace SiO<sub>2</sub> for successfully etching micro-structures in Si substrates (4;18-24).

Art Unit; 1756

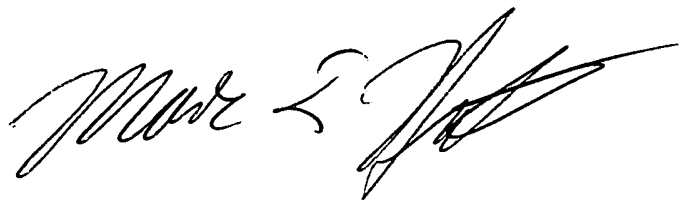
**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.

MH/ks  
February 12, 2003

A handwritten signature in black ink, appearing to read 'Mark F. Huff', with a stylized flourish at the end.

**MARK F. HUFF  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700**